Distr.
LIMITED

ID/WG.486/2
12 May 1989

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

Third Meeting of the Advisory Group
of the Industrial and Technological Information Bank (INTIB)

Vienna, Austria, 13-17 March 1989

ENHANCING THE INFORMATION FLOW WITHIN AND TO DEVELOPING COUNTRIES-

UNIDO ISSUE PAPER*

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* This document has not been edited.

V.89-55516

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In order to enhance the information flow within and to developing countries (including the establishment of access to international information services, which are mainly managed by developed countries), substantial and well-organized efforts are required to develop appropriate methodological frameworks and informatics infrastructures, covering communications, hardware and software.

1. Methodological framework

Step 1 – Identify needs

The first important phase, when establishing national informatics infrastructures, is to identify the types of basic network services needed to provide and utilize information services.

Step 2 – Investigate existing infrastructure

The next step is to investigate the national technical infrastructure, taking into account the following :

- existing networks and services

It is important to know if experience in using and operating information networks already exists. During the design phase (step 3), the necessity to incorporate existing and emerging networks should be considered.

- public services

Public data network services are crucial for system design, the X.25-type packet-switching services being paramount.

- use of standardized products

Standardized products facilitate implementation of an informatics infrastructure, the lack of which entails further development work, which is expensive and time consuming, but necessary.

The above items should be examined in order to obtain a clear picture to enable system design.

Step 3 – Design

We must then design the system we envisage. The overall architecture of an information infrastructure can be determined, based on available applications and technical possibilities and taking into consideration the following:

- end-user (workstation) access to facilities (physical means);
- local system architecture (LAN, gateways);
- communication infrastructure at the national level. (public data networks, private network, managed data network, etc.);
- access to international networks and information systems;
- information systems – structure, DBMS;

- user software interfaces.

Step 4 – Implementation

The selection and installation of appropriate micro- mini- and mainframe computers, communication devices and software should be carried out taking into account the availability of standardized and off-the-shelf products. Before regular operation of information services can be started, the following steps, in order of priority, are recommended:

- development phase – functional characteristics;
- testing phase – performance and reliability;
- experimental operation – user requirements;
- normal operation – maintenance, monitoring and evaluation of services, economy, service development.

Step 5 – Education and billing

- training of users and service providers;
- documentation – for users, managers, system designers;
- accounting – establishing a model for information services, taking into account international practices.

2. Informatics infrastructure

The previous chapter listed methods for assessing and developing informatics infrastructures – the respective components will now be considered.

2.1 Basic network services

There are some basic network services that are vital to the provision and use of information. Considering international experience and standardization, the following are recommended:

- message-handling for electronic mail;
- file transfer between users and/or information services;
- line-oriented remote terminal access to access external databases;
- directory services for accessing outside users and information resources.

2.2 Communication infrastructure

Implementation of national information networks, with international connections, will depend on the actual situation in a country and on planned or existing communication infrastructures (by local PTT authorities).

In particular the following should be considered:

- is there a public data communication network in operation in the country?;
- if there is a network available, then the information infrastructure should make coordinated use of it;

- if there is no public data communication network available, then the question is – is the PTT willing to operate a private network?;
- if yes, then it should establish a managed data network, based on a packet-switching service, with X.25 and PAD interfaces;
- if the PTT is not ready to operate a private network, then it should at least provide either digital leased-line services, or voice-grade leased-line services.

In order to extend national data communications to include international traffic, efforts should be made to obtain information from neighbouring, or other cooperating countries, on their present and planned data communication facilities. If work towards establishing links with other national data communication networks is already under way, this could be accelerated by setting up experimental network connections and by assisting potential network users who urgently wish to access other countries.

2.3 User-friendly interfacing and access to information services/databases

One of the most important requirements, is to allow users with a minimum of knowledge, both regarding computer technology and database management, to access desired information. For this purpose, a user interface is needed, which is capable of providing the following facilities:

- it should allow the design of user-oriented menus. In the framework of designing such menus, the definition of headings to be used, screen-attributes, programme calls and the loading of new menus should be facilitated. The programme calls should activate all services required by the user;
- database selection should be possible via the main menu (appears on the screen when the programme is started).

A substantial aspect of user-friendliness is the management of communications between the user and the network – such a communication interface should:

- hide details of the network calls from the user;
- allow access to services provided on a remote computer using a language with an easy-to-use syntax, e.g. one similar to PASCAL;
- facilitate the intelligent solution of problems arising in the network;
- provide means for bridging differences between coding systems of the local microcomputer and the remote host;
- in general, make accessing of remote services easy for any user with little training and experience in the management of computer networks.

Regarding access itself, two modes should be envisaged:

- line mode (this is at present the basic objective, even though it will disappear in the long-term);
- screen mode.

It should be stressed, that when the questions of interfacing and access are solved in hardware and software terms, a study of the economic/financial aspects should be undertaken before services are introduced. A system allowing simultaneous use of several databases, applying window techniques, will have a proportionately high running cost for communications and related items, which may become prohibitive from the point-of-view of economic viability. Similarly, the screen mode of accessing a database may be technically possible, but if it costs much more than line-mode, the latter may be preferable, economically.

2.4 Software tools for advanced information processing

Software tools for national network use should be selected and if necessary, adapted to local conditions, prior to the establishment of a national information and informatics infrastructure with links to other countries and international service providers. Tools should be selected on the basis of international experience, and acquired for testing and evaluation. These activities should be undertaken in a harmonised, coordinated manner by institutions wishing to participate in national networking activities. In particular, database management systems, the use of compact disk technology, etc. could be studied and evaluated.

3. Management of an Infrastructure project

An information infrastructure project is necessarily complex – a number of institutions participate, some as information providers, others as communication service providers, others again being interested in software selection, testing, installation or training, etc.

Such a complex activity needs appropriate management tools and facilities, in particular a project database and electronic mail facilities.

A project database may include information on:

- participating institutions;
- experts in charge of specific activities;
- content contributing to the creation of the nationwide network – objectives, outputs, activities, inputs of various sub-projects;
- tools used in connection with the project, in particular standards, guidelines, etc.;
- products resulting from cooperative efforts, such as system design, test reports, comparative studies, decisions made, agreements, etc.

Electronic mail facilities can be established with a limited number of functioning participants, and be used at least as a learning device, which could later be extended, as the development of computer networking in a country allows. Equally, use may be made, in early stages, of facilities offered by another country having the necessary computing capacity and software.

4. Activities relating to computerized networking

During the last year and a half, the topic of networking and computerized information handling, has been the subject of discussions in many UNDP-funded European regional projects.

In a UNIDO-executed project, a software application has been developed, using micro-ISIS software, that is already in use in ten centres dealing with energy conservation in industry. UNIDO has also joined discussions related to a UNESCO-executed project, which is looking at information networking in the context of decision-making for selected priority sectors of the participating institutions.

There is a working group within the latter project examining basic computer and communication tools that will support the topical questions being examined and the institutions involved have expressed their willingness to transfer the results and experience gained to developing countries. A number of documents and reports, covering the methodological framework for networking, with items corresponding to those recommended in this issue paper, are planned for the near future.

The activities envisage making extensive use of the CDS-ISIS software developed by UNESCO, which is available both in mainframe and microcomputer versions for use on IBM and compatible computers. This software is well-known in developing countries. It is foreseen that a number of improvements to this software will be implemented, *inter alia*:

- a user-friendly interface, which has already been elaborated for micro-ISIS – the TEKA – providing twenty menus and twenty possible variations for selection. Five languages can be used on each installation and programmes are started automatically;
- the introduction of links between fields in a record (in micro-ISIS), allowing. e.g. to specify connections between authors and projects, authors and institutes etc., in records containing several authors, institutions, etc.
- international character handling, which, in the mainframe version of CDS-ISIS, will be enhanced by allowing on-line modules to recognize all Roman characters, permitting the use of different types of terminals in a system.

5. Contributions of UNIDO

UNIDO has a long-established major mechanism for the transmission of reliable and continuous information to developing countries, with a view to meeting the specific needs of Government departments and institutions, manufacturing enterprises and enterpreneurs – the Industrial and Technological Information Bank (INTIB) – which includes an Industrial Inquiry Service. During the last three years UNIDO has carried out a number of activities to facilitate, increase and accelerate the flow of information to INTIB users, including:

- the generation of industrial information through better and more efficient use of existing internal information systems, such as INDIS, the Energy Information System (EIS), TIES, INPRIS;
- the improvement of the Industrial Inquiry Service with greater emphasis on networking through establishing and supporting INTIB National Focal Points;
- the introduction of modern data-processing techniques in INTIB and its National Focal Points and training staff in their effective use;
- the establishment and development of specific databases, *inter-alia* CLEANTEC DATA for environmental technologies,
- the incorporation of the INTIB concept in UNIDO's technical assistance programme, to provide assistance in formulating national information policies, building up and strengthening national and regional information infrastructures and networks, promoting new information technologies, such as on-line connections and the use of electronic mail, creating industrial databanks and training and upgrading information specialists.

UNIDO's first attempt to standardize the approach to information exchange in a network environment was recently launched – the European INECA (Industrial Energy Conservation Abstracts) network has been designed to record, exchange and disseminate factual information related to the activities of a number of sectoral focal points, national training centres and national contacts. UNIDO's aim is to facilitate the flow of information to developing countries, in particular by the means of standardized computer applications, standards established for electronic communication and the provision of methods for accessing external computerized information sources.

Microcomputer applications (*inter alia* INECA and CLEANTEC DATA in standardized form), use the micro-CDS-ISIS software package. Links between this software and other software tools, in particular desk-top publishing, which is already being used to convert UNIDO databases directly into typeset quality hard-copy output, are being developed.

6 CONCLUSION

Taking the above points, raised in sections 1–5, into consideration, as well as questions raised by the various papers submitted, UNIDO's Industrial Information Section requests participants at this panel to discuss the following:

- what are the main computer-based topics to be developed by UNIDO INTIB in the 1990s, to enhance the flow of information to developing countries?
- what steps should be taken, in order of preference, to develop a "global" UN-based computerized system for information exchange?
- which data base owners/vendors could be willing to join in the above effort to pass on existing information sources to developing countries?

Recommendations on these questions, and any others worthy of future development, must be realistic in terms of United Nations capacities and budgetary restrictions.